The Michigan Antique Radio Chronicle

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A QUARTERLY WRITTEN FORUM OF THE MICHIGAN ANTIQUE RADIO CLUB

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This beautiful Zenith "Walton" was sold in the EXTRAVAGANZA '16 auction

THE MICHIGAN ANTIQUE RADIO CLUB

The Michigan Antique Radio Club was founded October 19, 1985 at the Dillon Inn in Lansing, Michigan. Present at this historical meeting to found MARC were Jim and Brenda Clark, Larry Anderson, Karl Rommel, Mike Male, Dick Perry and John Kent. The purpose of the organization is to preserve the history and enhance the knowledge of radio, television, and related disciplines, with special emphasis on contributions originating in the state of Michigan. Dues for membership in M.A.R.C. are $25.00 annually (US funds) and payable in January. Officers of M.A.R.C. welcome your membership, your questions and your personal contributions to enhance the service value, growth and activities of the organization. Terms of office for Board members expire concurrently with the summer EXTRAVAGANZA meet held in Kalamazoo, Michigan. Send Correspondence to MARC, 311 Wordsworth St., Ferndale, MI 48220. E-mail: president@michiganantiqueradio.org. **Visit our Web site at** www.michiganantiqueradio.org.

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Call for Photos and Stories

We are always in need of photos and stories from our readers. If you have a good photo of one of your favorite collectables, please send it our way. And if it has an interested story behind it, even better. Also, we are always open to new articles. Or if you have an idea for a topic you would like to see us cover, let us know.

Steve Enzer, Editor

Perspectives

As no doubt you noticed at EXTRAVAGANZA this year my name did not appear on the ballot for President. After 16 years, I decided that what would amount to 4 Presidential terms was enough and it was time for me to step aside to make room for fresh perspectives. Our new president is Jeff Lilly and you will not find a better choice. Be sure to welcome him to his new responsibilities and offer him your services.

I want to thank all of the board members and members at large who have done such a great job of helping out over my tenure as President. You made my job possible.

As you can see in this edition of the Chronicle, I will continue to keep the crew in Centerburg engaged in interesting and, I hope, entertaining adventures. I remain on the Board as well.

Thanks again for making this one of the best, if not THE best radio and electronics club in the country.

John Reinicke

Hello, everyone. I find myself in the strange position of introducing myself to you all as the new president of the Michigan Antique Radio Club. I'm still not sure how I got here, but I'm pleased to have arrived.

My name is Jeff Lilly. I'm in my 40s, live in Ferndale, MI, and have been in the hobby for about fifteen years. I served as a board member and later as vice-president before John turned the reins over to me. Looking at the accomplishments of my predecessors, Jim Clark and John Reinicke, I have some big shoes to fill. Or, maybe, some big capacitors to stuff.

The hobby is changing and evolving. Old members pass and new ones join. The new members share interests and passions, but things are never the same as before. Along with antique radios, there are new electronics collectibles finding enthusiasts; early computers, calculators, boomboxes. Also, cycles repeat as old gems come back into vogue. Vinyl, anyone?

You might have noticed a bit of re-branding going on in the last year or two. The Vintage Electronics Expo isn't just a name. It's an effort to expand our reach and our base, to bring in new members with new interests, learning from each other and cross-pollinating. We're looking to expand our presence online, and plan to ramp up our use of social media to help get the word out about the club and our activities. We're looking at new ways to deliver information and promote the club and its shows to members and the public at large.

This effort isn't without its problems and perils. Growing pains can be a pain. Older members might fear we're losing our focus. Newer members might be frustrated at how we cling to certain traditions. We ask that you be patient and pardon our dust. We undertake this with the knowledge that growth and change are critical to the health and survival of the club. I'm the third president of MARC so far. I don't want to be the last.

On the other hand, we're still putting on the same great shows at Farmington and Kalamazoo. We're still publishing the Chronicle (and the Centerburg crew are still with us, and will be, as long as John wants to continue.) We still welcome and encourage your feedback, your ideas, your stories, and your memories. The club was founded for you, the members, and the members remain our best and most valuable asset.

So, here we go!

Jeff Lilly

NOTES FROM THE SERVICE SHOP

No. 95

by John Reinicke

Time and Audio Stuff

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My drive to Centerburg had been uneventful, but the hot weather insured that I kept the widows up and the AC on. I also had appreciated that Ken had put a window unit in the apartment above their shop for my benefit – no sleeping with the windows open for me.

The next morning found me with Ken and Betty in the room at the back of their Antique Shop. We were all enjoying Betty's robust coffee, some really quite remarkable scones, and breakfast sandwiches that Ken had picked up. These early morning gatherings before they open the shop provide us with a chance to share family gossip and photos. This morning, the weather of the previous week became a topic of discussion.

"Wow, I heard in the news that you guys had quite a rainstorm last week. It is usually not a good thing when local weather makes the national news," I noted with some concern. "So how did you guys make out?"

Ken shook his head with a wry grin. "As it turns out we were lucky in a lot of ways. We didn't escape unscathed, but considering the circumstances, it was OK."

I nodded with a concerned look and waved for Ken to continue. "It really was quite a storm. One TV newscaster said it was a thousand year event since some areas around here got over ten inches of rain in six hours. Now a hurricane might bring that much rain in the tropics, but man, it just doesn't happen here. The shop here on the north side of the square is on high ground so here it was above the high water. Unfortunately on the south side of the square the river overflowed right into south High Street and the shops on that side of town really did get wet.

"The lucky part for us was that I happened to be at our building on the south side of town when the storm rolled in. We had just unloaded a bunch of items from three estate sales and I was getting them cataloged. About an hour into the storm, my phone went off with a flash flood warning and that caused me to think. I did a bit of a mental calculation about how far downhill I had to drive to cross the river to get back here and it occurred to me that it really wasn't much of a drop. That thought inspired me to get everything on pallets and to get those pallets on the higher shelves. I spent the next three hours stacking and

stacking. By the time I had moved stuff off the floor I looked out and I could see the parking lot was covered and the water was starting to come in under the roll top door at the back of the high bay space.

"With our stock on shelves, I checked the office space. There, the carpet was already 'squishy' and I took out the bottom file cabinet drawers and stacked them on desks and tables. I also grabbed all the outlet strips and put them up as well. When I grabbed the outlet strips it dawned on me that it might be a good idea to kill power to the building and I opened the main disconnect just in case.

"I had been so intent on getting things to 'high ground' that it was only after I found myself in a dark building that it occurred to me that maybe I wasn't in the best place to be. As it turns out, our building is on the highest ground in that area and when I looked out, I could see that any escape routes were well underwater."

"So what did you do?" I asked with some concern.

"At that point, I decided to wait it out. The rain stopped but the water kept rising for the next several hours. Fortunately it never got over a foot deep and all of our stock stayed dry or at least above water. Unfortunately for me, I wound up spending the night and a good bit of the next day subsisting on bottled water and energy bars. I can assure you that sleeping on a desk isn't all that comfortable but I did fine. By the time the water went down, I was very glad that our office had block walls rather than drywall. I was also glad our air conditioning units are on the roof. The damage to the building was really limited to a couple of feet of insulation in the walls and the carpet in the office was a mess. All the filing cabinets left rusty footprints but none of the important stuff was damaged. We were even lucky that the water we got didn't have a lot of mud. The shops here on South High had mud to clean out."

"Did it occur to you to call for help?" I asked.

Ken shook his head. "Ya know, I really thought I had it under control and I figured that the emergency responders would be busy with folks on lower ground. Of course, I let Betty know that I was OK and I was glad my phone had a good charge. I suppose it is a good thing that cell towers tend to be on high ground."

I had to agree, that it was quite an adventure.

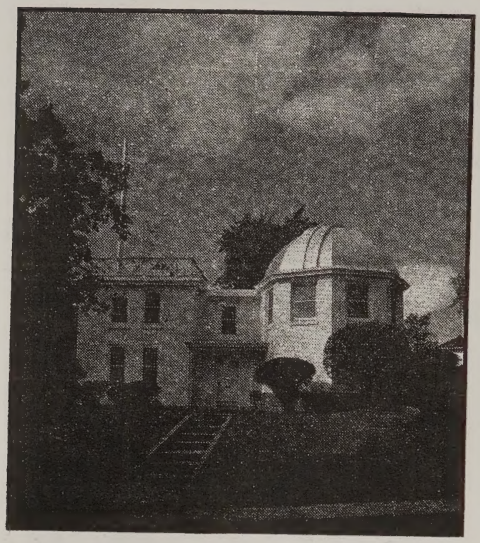
Betty was smiling when she added, "Well, Ken, there was one important item that you missed."

Ken laughed, "OK so I forgot the carton of toilet paper in the john. At least it really did absorb a bunch of water. On a brighter note, I want to show you something." He turned to me and then pointed across the room. "Didn't you say you just got back from an old radio meet in Chicago?"

I nodded, "Yep, just got back from the ARCI meet."

"And didn't they used to meet in Elgin?" Again I nodded. Ken continued, "Well one of those estates I rescued from the drink came from that part of the world and I think you will find this interesting."

I followed Ken over to a clock that was mounted in a tall glass cylinder. It was clearly an older clock and very well made. It was also obvious that this was some sort of laboratory apparatus rather than a decorative timepiece. Ken could see my quizzical look and explained. "This clock had been a part of station W9XAM which was used to transmit experimental time signals from the Elgin Observatory which was owned by the Elgin National Watch Company, in Elgin

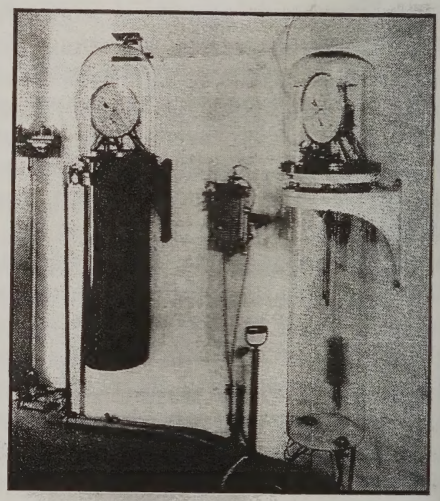


Elgin Time Observatory

Illinois. The observatory opened in 1912 and this clock and the station dates to the late 30's. In these days, when we can get quite accurate time just by looking at our phones it is interesting to consider how time was kept in those days. Of course, in the early 19th century, time was a local affair, usually based on the local solar noon – that is when the shadow from a stick pointed due north. For a long time, this was quite satisfactory. However, once rail traffic became common it made train schedules all but impossible and the idea of the 4 time zones we now know came into existence. The time zones were required to make train schedules possible or at least rational. Of course, good timekeeping is necessary for navigation and worldwide time was established by the British based on the zero meridian passing through Greenwich, England. Thus, Greenwich Mean Time was established and the time zones are based on an offset from GMT. Of course, these days we call it Coordinated Universal Time and the military has always called it Zulu time. So if you have things going on all around the world, or are a radio amateur with connections in other time zones, keeping track of things by Zulu time insures everyone 'knows when' it happened or needs to happen.

"By the late 30's radio was an accepted way to synchronize clocks all over the country. The time standards for the country were being kept by the Naval Observatory in Washington DC and they were transmitted by radio. The Navy operated six stations in those days and the Elgin observatory provided a 7th for coverage in the Midwest since the Naval stations were on the East and West coasts, Hawaii and Panama. I did some research and found the type of signals used and found a chart listing the series of dashes that were transmitted starting five minutes before the hour.

"This rather interesting clock was used to control the transmissions. You will note that it is enclosed in a bell jar and, in operation it was under partial vacuum thus reducing the effect of atmosphere on the pendulum. The clock would be synchronized via observation of the passing of fixed stars through their zenith. The clock could only be synced on clear nights, so the clock had to maintain time very well between observations. I think the observatory maintained



Elgin time standard clocks

two of these clocks to insure redundancy at the very least. Perhaps on any given night only one would be adjusted to allow for, shall we say, operator error which must have been quite rare."

"Wow, that is a cool clock. It must be quite rare but is it valuable?" I asked. "How did you get it?"

Ken had a half smile. "Well, (a fair Jack Benny) it is quite rare if not unique. This might be the only surviving example. As for value, clock collectors tend to be drawn to the aesthetic and this one is all function. However, it is, well, just plain cool. As for value, because of the rarity, there isn't any auction price that I can find so I really don't know what it would bring. I really like it so I think I will just keep it on display for a while. I know a really good clockmaker so I may send it out for cleaning and lubrication so I can display it in operation.

"As for how I got it – as I said, we picked up a bunch of stuff at an estate in the Elgin area. The Chicago area really is a great area for estates and this was no exception. In this case a great grandfather had worked at the Observatory and when this clock was retired, he brought it home and it wound up parked in a bedroom closet. As a picker, I really like stuff from closets rather than basements, attics or barns. As you can see, it is in good shape and the only marks on it are due to wear that would be consistent with use."

I spent some time taking a close look at the clock and returned to our conversation. After a few more minutes it was time for them to open the shop and, as arranged, I headed out to walk over to Art's shop to see what was going on. When I stepped out the front door to head up High Street, it was like stepping into a sauna. It was already a hot day!

As I came up the street to Art's shop, I noticed that Art was on the roof of his shop and was doing something where the roof of the shop joined the foundation under his front porch. Instead of going in the shop, I went up the steps to the left of the shop to his porch. I leaned over the railing to see what he was up to. He had not noticed my approach and did a bit of a start when I asked, "What are you up to on a hot morning like this?"

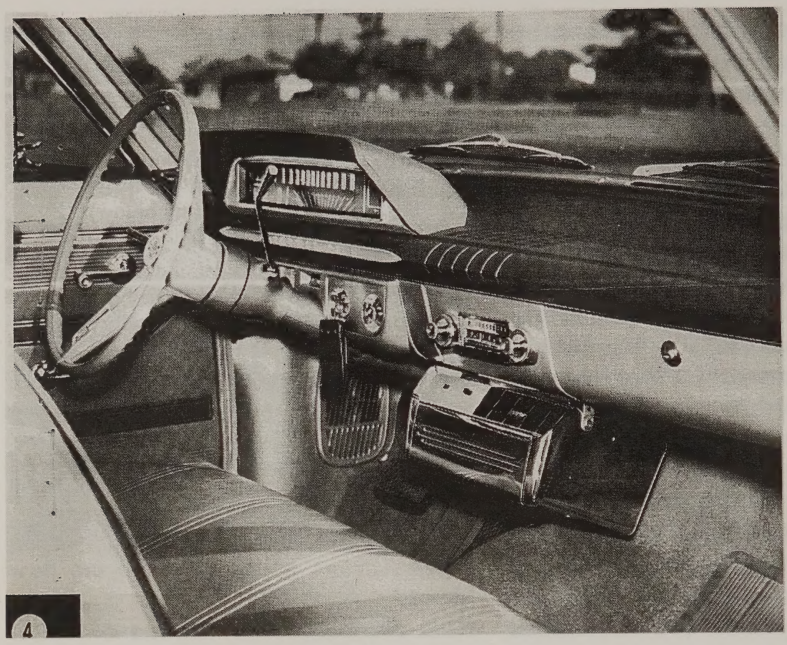
"Yes it is a hot morning! That is why I am doing this while it is still sort of in the shade. In all that rain last week I discovered a bit of leak here where this stupid flat roof meets the porch foundation. It made for a real nuisance puddle on the shop floor. This is the first day it has been dry enough to use this roofing sealer. I am happy to say, I am now done!"

Art hoisted the bucket of sealer over the rail and then climbed over himself. He indicated we should walk around to the back so he wouldn't track through the living room. We were greeted at the back door by his wife who had two glasses of ice water. We sat at the kitchen table for a visit as Art cooled off. He pulled off his ball cap and wiped his face and head with an old towel. With the glasses emptied and refilled, we headed down the basement steps, across the basement and into the shop. As I stepped down into the shop, Art flipped on the lights and the first thing I noticed was a stack of black painted boxes with a chrome front.

I pointed to the stack, "Are those what I think they are?"

"Depends – what do you think they are?"

"They look like they might be those under dash 45 RPM record players from the late 50's or early 60's. I don't recall seeing one even back 'in the day' and here you appear to have quite a number of them. I suspect there might be a story here," I noted with a smile.



Under-dash mounted 45 record changer

RCA, Norelco by Phillips, and ARC brands here."

Art gave me a wink. "If you look closely you will see there are really only two mechanical variants there. ARC made the RCA branded unit and there are only minor cosmetic differences."

"So how are they different?"

"I think the Norelco may have been the first because it is designed to work with both 6 and 12 Volt auto systems with either a positive or negative ground on the battery. The Norelco had to be wired into the radio and, therefore, required radio modifications. You had to make connections at the volume control of the radio and the switch from radio to phono was in the underdash unit. In those days, not a lot of radio mechanics had a place to work on cars and a lot of car mechanics really weren't all that proficient at electronics work. In most cases the car mechanic would remove the radio and send it off to a radio shop for repairs or modification. That meant, unless you were quite handy, you had two trips to a car shop to complete the installation.

"The other disadvantage of the Norelco unit was that it would only play one side of a single record. You would insert the record and it would play and when it was done, the player would eject it. The process reminds me of a more modern CD or DVD player. The positive thing is that these Norelco units were

Art responded with a broad grin. "Yes, there is a story. I have a customer who is a car collector and, as it turns out, these things can be quite popular at car shows. Of course, they are not the factory original one usually associates with car shows but they are an accessory that was available at the time and if you are showing a car from that era, it adds a novel and authentic distinction. They were an interesting idea but it doesn't take a lot of imagination to realize that playing a record in a moving car might not work out all that well. I suppose the folks who actually used them got really really good at driving smoothly and avoiding rough roads and potholes. I think that might explain why they didn't sell all that well and they were around for just a few years. Of course the competition from 8 track players and later cassettes didn't help."

I studied the stack. "In spite of the limited market, it looks like there are some variants here so there must have been some competition. I see you have

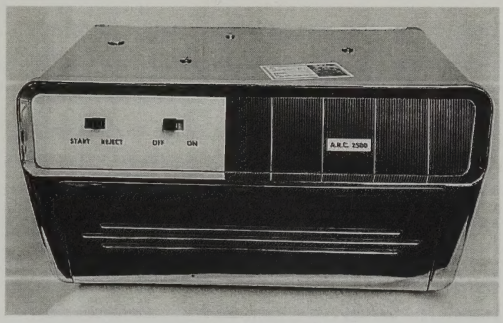
exceptionally well made and they required very little attention to get them playing.

"The ARC units have the advantage of using a record changer so you could stack up to about a maximum of 10 records at once. The changer hangs upside down from three coil springs and all of the records are pushed onto the spindle. Once a record is played, as the changer cycles, it is dropped off the spindle and lands on the bottom of the player where it can be retrieved. Again, if you think about it, if you figure a typical song is about 3 minutes you only got half an hour of music at best. Then you had to open the door, retrieve the records to either flip the stack over or put in a new stack. Because the door opens upward, this whole process has to be done by feel, since you would have to bend over 'till your head was almost touching the seat in order to see in. And these days we think texting while driving is distracting. I expect the nuisance of dealing with the records also contributed to slow sales.

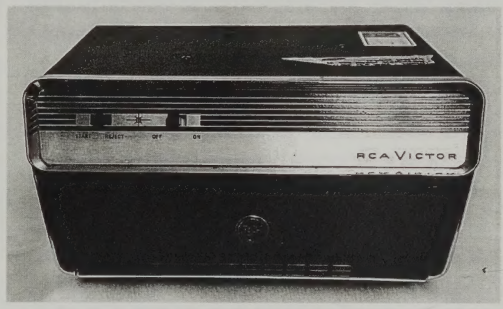
"The ARC units would only work on 12 Volt systems but did have a switch for positive or negative ground. In a lot of the ARC units, they included a 'phono oscillator' so the signal would be broadcast to the radio. These units included a little adaptor that went in series with the radio antenna connection. The advantage with this is that no radio modifications were required."

"So what did you have to do to get them working?" I asked.

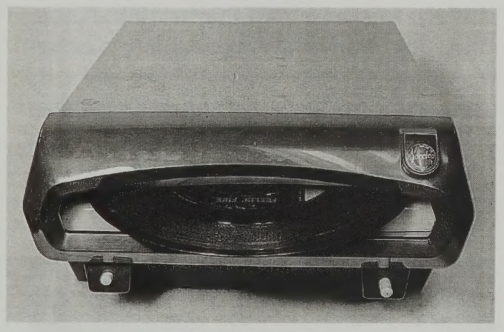
Art responded with a snappy, "The usual! They are after all, record changers and like all changers the grease and lubrication turns to either goo or glue and the mechanism will be really gummy or frozen. Like just about all record players of the time, these use an idler wheel to couple the motor to the turntable and, like changers of this period, the idler wheels



ARC2500 Version



RCA Version



Phillips Version

were hard as a rock, thus providing just about no traction. Of course, spending time in a hot car helps contribute to the deterioration and like most 60 year old car radios they were quite grimy. They use a 'power point' cartridge and these don't age well. The innards are held together with rubber and like the rubber in the idler wheel that gets hard and shrinks. Even if the stylus is still good, the innards often simply fall out. Fortunately, your friend, Gary Stork (thevoiceofmusic.com) has replacements

on hand. So the repair was usually a straight forward disassemble, clean, lube and reassemble."

"Usually?" I responded with a grin since I knew that repairs on old things can sometimes go astray.

'Yea, usually – The phono oscillator is mounted in a potted box. Repairs are not possible. Fortunately, only two were kaput. In those cases I modified the unit to include a switch for the radio audio and those will have to be wired to the volume control. In only one of them I had a problem with the little DC motor. These motors use permanent magnets and have a little centrifugal switch on the armature to control speed. In one of the motors the switch contacts needed cleaning and to add to the aggravation there was a bad solder joint on the commutator. There is a screw to adjust the contact on the centrifugal switch to adjust speed, which is accessible through a hole in the outside of the assembled motor. Since the screw spins with the armature, adjustments are a 'bit cut and try'. You make the very slight tweak and then test. It took me about 5 or 6 tries until I decided that it was close enough.

"Once you get them working they do work fairly well. I would not describe the audio quality as exactly High Fidelity but it is pleasant. Of course they work best in a stationary car although I must say I was surprised how well they do in a moving car - at least if it is one of those wonderful 'land yachts' from the late 50's. I suppose the only other consideration for the modern collector is that, in the case of the ones that wired directly into the car radio, the phono cartridge expects a load of 500 K to one meg-Ohm. In an old tube type radio, that is no problem since the volume control was just that – 500K to one meg. However, if someone has installed a more recent solid-state radio or solid-state conversion, the load impedance will probably be too low to work well and some sort of pre-amp will be in order. I suppose that isn't a big deal, but it would be more 'fussing around'."

I walked over to the stack of players and lifted a door. I thought it was interesting to see the changer hanging upside down and noted that the little clips that hold the record held the records toward the turntable rather than away from the turntable. "So, Art, I see how you slip on the records. How do you get them off if you don't want to play them or cycle the changer?"

Art gave me that, 'isn't it obvious' look. "See that little knob in the center of the spindle?" I bent over, looked and nodded. "Give it a turn."

With his prompting I reached in and gave it a twist and, as I did, the clips retracted. "That works well," I responded.

Art tilted his head. "Yes it does. I came up with some interesting tricks to get those spindles back together. As is the case with changers in general, you really have to pay attention when you take it apart and it doesn't hurt to take photos as well."

I closed the door on the changer with a smile. "Yep, it really is cool." I looked up and around the shop. "So what is that on your bench today?" I could see that he had his audio generator and harmonic distortion analyzer connected to an imposing audio amplifier. Art's huge load resistors hung over his bench with the leads running down to the amplifier output.

Art's face took on a huge grin. "That, my dear friend, is a Marantz 250. As you can see it is designed for rack mounting and it really was state of the art in its day. The 250 name comes from the fact it will put out 125 Watts per channel. As you can see, it has a brushed chrome front with two really neat blue-green faced meters. The circuit is all analog, of course, and makes use exclusively

of bipolar transistors – there are no integrated circuits at all. The power transformer is huge and, along with the rest of the power supply, is quite conservatively rated. Of course, that means this amplifier is also quite heavy! There are a large number of transistors and the circuit makes extensive use of inverse feedback in all of the direct-coupled stages.

"I finished testing it last night and I must say, that really complex circuit does make for exceptionally low distortion and at the 125 Watt rated output the distortion is so low I can barely measure it with my trusty HP distortion analyzer. And the distortion is that low throughout the 20 Hertz to 20 Kilo Hertz range. On these high power amplifiers, I also measure distortion at the 1-Watt level to see if crossover distortion becomes an issue. In the case of this amplifier, that too, was almost vanishingly small. If you are looking for an amplifier with very low distortion, which I would say is the essence of High Fidelity, this is absolutely as good as it gets. These days, for a few hundred bucks, you can get a four thousand Watt amplifier that is a third the size and weight and much more efficient but that new amplifier makes extensive use of switching and digital circuits. I guess I will leave it up to you to decide if you can hear the difference."

"So, if it is all that great, why is it on your bench?" I had what I thought was a wry smile.

"It is 45 years old," Art responded. "As it turned out, it gave me a number of lessons to boot."

I waved for him to continue.

"When it came in I noted a couple of things. The first was that it had not been stored in a good location so it was grimy and had some rust showing. The second thing I noticed was that the power fuse was blown. The fuse in the holder was half the called for rating, but the inside of the glass was quite black and metallic so I figured that the fuse had been blown because of a short rather than because of an overload because it was too small.

"The nice thing about this amplifier is that all of the power supply connections are paralleled under the screws on the filter capacitors so I just removed the two screws on the positive and negative leads and quickly found a dead short on one channel. Since the output transistors are mounted in sockets, it didn't take long to remove them and, as expected, I found two shorted transistors, an NPN and PNP pair. It is not uncommon to find this kind of problem in an older high power amplifier, so I was not surprised. Further, I found that NTE replacements are still available. Not only are they available, but the replacements come as matched pairs. Since this amp makes use of paralleled transistors I decided it would be wise to replace the two pairs on that channel. Of course, I said the replacement transistors were available but I didn't mention one has to pay a considerable premium to get them. The fact two matched sets are required serves to double the cost.

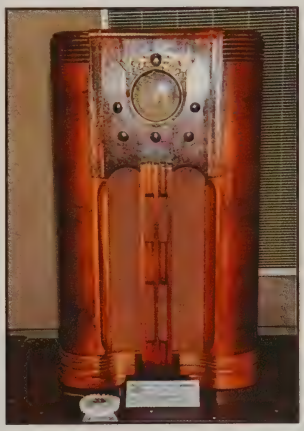
"I ordered the transistors and put the amplifier to the side until they came in. I resumed repairs a couple of days later. Anytime I find shorted output transistors I always am concerned about what might have caused them to fail. Of course, the speaker leads could have been hit by lighting, but that is extremely unlikely. Shorted speaker leads are a very real possibility, but most amplifiers including this one, have current limiting circuits to protect the transistors. With the protective circuits, most folks notice the short long before they cook the transistors. So --- I always check the rest of the circuit for what may have caused the problem. Often you will find another

(Continued on page 17)

EXTRAVAGANZA 2016

*Lowell Muehlbrandt won first place in Department Store Radios, as well as the **People's Choice Award**, for his Montgomery Ward Airline Lone Ranger (M-1541) and Rudolph (M-1540) sets from 1950-51.*

This unusual bookcase radio from Macy's, model 711 from 1932, won second place in Department Store Radios for Charley McKee.



Third place in Department Store Radios went to Chris Deneau for his 1938 Truetone model D690.

A 1931 Cable-Nelson model D-4 won first place in Orphan Radios for John Waugaman.

Second place in Orphans went to this Modern Rsia (year unknown) owned by Lowell Muehlbrandt.

Ed Dupart's Morris Register Co. set from 1925 won third place in Orphans.

This beautiful Detrola model 3280 clock radio from 1939 won first place in Major Brands for Chris Deneau.

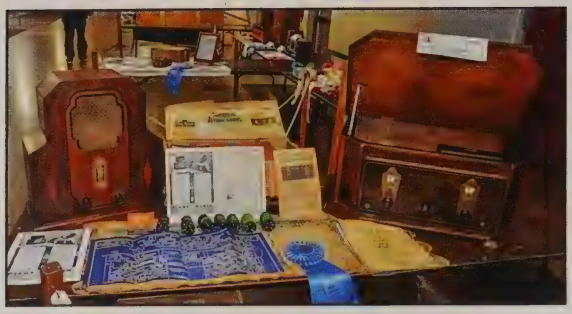
John Reinicke's elegant chrome finish restoration on a 1946 Hallicrafters S-38 won second place in Major Brands as well as ***Best of Show****.*

Third place in Major Brands went to this Grundig Hi-Fi Studio 505U from 1966 owned by John Crawford.

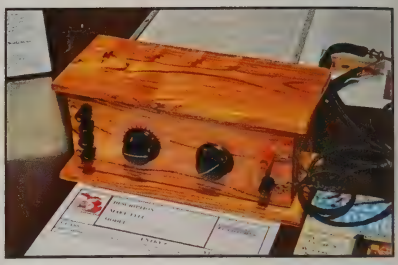
This Brush of Zanesville "Mystic Bug" from 1928 won first place in Novelties for Robert Sands.

Second place in Novelties went to Lowell Muehlbrandt's Majestic Melody Cruiser, model 921, from 1946.

A collection of novelty radios won third place in its class for Art Kiel.



First place in the Open went to Geoffrey Bourne's Pilot Midget and Pilot Superwasp from 1931.



A home brew built by Ed Dupart using three Raytheon transistors won second place in the Open. (See article on next page.)

A pair of devices made by Detroit Radio in 1922 won third place in the Open for Bob Dobush.

*The **Best Restoration award** went to Stephen Sliger's 1946 Western Auto/Truetone D2610, shown with a Crosley CR-4 replica.*

*Bob Sands won the **Best Preservation** award with his 1938 Coronado model 767.*

*The **Chairman's Award** went to this 1941 Silvertone R111, chassis 101615, owned by Bill Nolting.*

The Raytheon 3-Transistor Radio

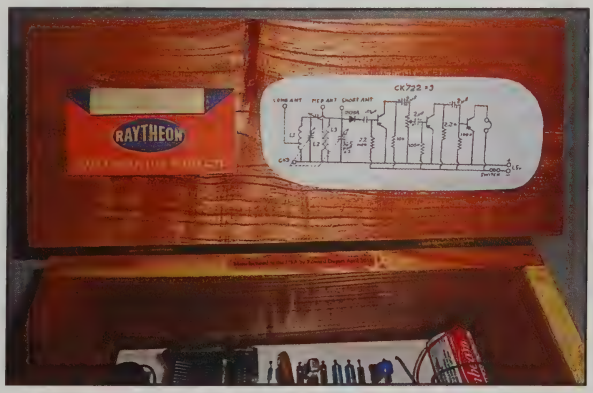
By Edward Dupart

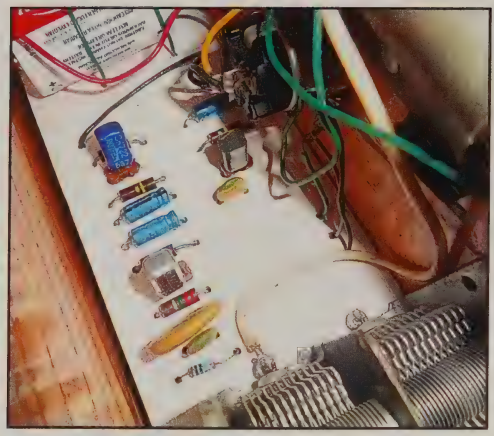
For many of us the Popular Electronics magazines were a source of entertainment and education and we couldn't wait for the next month's issue. The local drugstore down the street in Detroit, complete with a soda fountain, was my source for magazines and I knew when to check for the latest issue of Popular Electronics.

The January 1960 issue had a one transistor radio that used a 2N217 transistor, a 1N54A diode and a long, 7 ¼", ferrite rod loop antenna and I wanted to build it. The 2N217 is the same as the 2N109, which I had. The 1N54A was a special high back resistance diode that I couldn't obtain at that time so I had to use the time tested 1N34A. Forget the long ferrite bar, I had to use an adjustable Miller high Q coil that a lot of us would like to have now. I put the little radio together and used a plastic box and I adjusted the coil to tune in my stations. It worked good and I could run it along a wall and find the electrical wiring because it would act as an antenna and the station would get loud when near the electrical wiring. While it worked quite well in Detroit and it was neat to have and I could sneak it into school, it just didn't have that long ferrite bar I wanted to experiment with.

In the late 1960's I had to make room, so I gave a neighbor who was into electronics all my Popular Electronics, but I always wished I had kept that January 1960 issue. Not that I needed it for the circuit, because I had it memorized and made several radios after that with basically the same circuit, I just wanted it, because I wanted it. So from the 1980's on the search was on and it wasn't until 2015 I found that January 1960 issue along with almost a complete set of Popular Electronics from about 1956 to about 1964 at an estate sale in Michigan. Now I'm happy.

Now that I have my January 1960 Popular Electronics magazine next to me, I decided to build that one transistor radio. My junk box contained several loopsticks and lo and behold there was one with a 7 ¼" ferrite bar from a tube radio that pretty much matched the hand wound coil in the January 1960 Pop Electronics' article. As far as transistors go, I

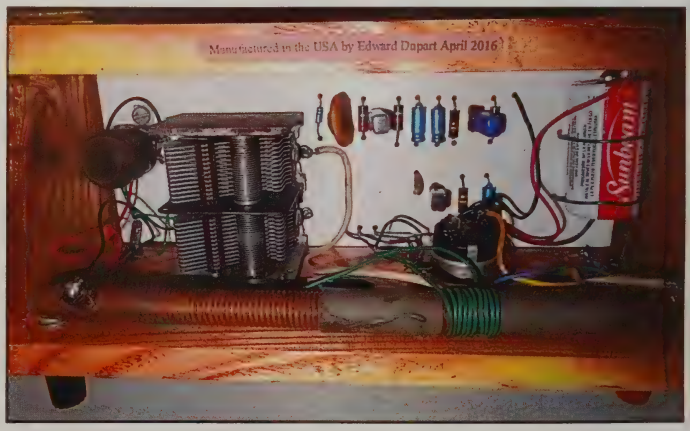




have lots of them, so I decided to try several vintage transistors and the first one I picked is a high quality GE transistor that looks just like a 2N107 with the pinched top but is actually a high speed GE PNP germanium transistor. Luckily, I have a 1N54A diode and all the rest of the parts. So I put it together and it worked quite well and it picked up the local station without an external antenna and with that loop antenna it was quite directional. I decided to compare the 1N54A with other diodes and it didn't work any better than a 1N34A. So I tried a 1N110 diode from a 1950's computer circuit board that used tubes and I have found this diode to work very well in crystal radios and I think it worked better than the 1N34A and the 1N54A so I left the 1N110 in the circuit. My one transistor radio is now complete and works very well on 1½ volts and is sill on a breadboard.

Surely I can improve on this circuit so why not add an additional transistor for audio amplification and I did. That really increased the volume and would drive a speaker in a quiet room and on 1½ volts! I wondered what would happen if I added a third transistor. So I added a third transistor and now it's really loud and I needed to add a volume control, which I did and a 100K pot worked well. All three transistors were the same late 50's GE computer transistors. With an outside antenna and a variometer for antenna matching I was able to pick up at night, Nashville, Chicago, Louisville, Cleveland and a few others. Not bad for a simple circuit, but I'm not through.

Most people reading this will remember the first hobbyist transistor introduced by Raytheon, the CK722 in 1952, that were the hearing aid transistor CK718 rejects. They didn't meet the specs for the hearing aid but were good enough for a lot of simple circuits and they became an overnight success. I had several of them and I really liked the pretty blue ones and I built a lot of circuits with them, but they weren't as good as the RCA 2N109. The CK722 came in three colors. The black one was used from 1952 to 1955 and the pretty blue one was introduced in 1955 and the silver one was introduced in the late 1950's. Most of the date codes I see for the silver one are 1960, and 1964 was maybe the last year of production for the CK722.[1] (Jack Ward www.ck722museum.com) I always want-



(Continued on page 18)

(The Shop, continued from page 11)

shorted or open transistor or a shorted capacitor."

"So, did you find anything this time?"

"That I did, and to my surprise, it was introduced by Marantz when they designed and built this thing. I suppose the engineer can be forgiven for overlooking a couple of things, particularly since the resultant troubles came up long after what must have been the projected life expectancy.

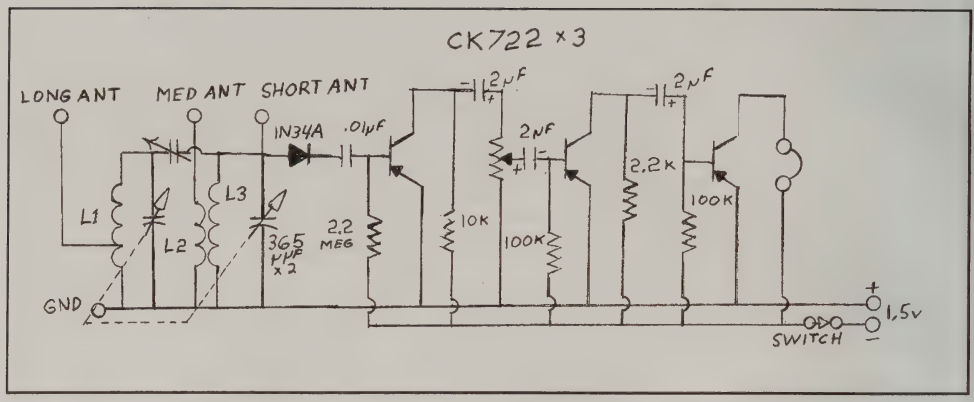
Notice the tone arm below the record currently playing. When finished, a record is dropped off the spindle.

"The first observation was the circuit board had a surprising number of cold solder joints. This is a problem that has plagued production folks for decades. The board must spend enough time in the hot solder wave to get good heat transfer and therefore, good wetting. However, if it is in the wave too long, you will fry smaller components. Plus, the quicker it passes through the solder bath, the more that can be produced. Obviously, in this case, they compromised on a quicker pass.

Marantz 250

"Of course, cold solder is easy to fix and I spent several minutes touching up the solder joints. As I was doing this, I noticed that a previous mechanic had tacked a resistor in parallel with one that was on the board. This inspired further checking. There are two 39 Ohm, one Watt, resistors in the base leads of the output transistors, R529 and R530. These resistors are really important because they provide load for the drive transistors. Without the load resistors the drive would be far too high and that could certainly overdrive the transistors, which could cause the shorts I discovered. This is particularly important in this amplifier because the complementary outputs are connected in a common emitter configuration – the load is on the collectors. This can make for lower distortion than an emitter follower configuration but it does require careful control.

(Continued on page 23)



(3-Transistor Radio continued from page 16)

ed to put these three variations of the CK722 in a circuit and I now have the ideal circuit to do it with.

I replaced the high quality GE transistors with the Raytheon units and what I discovered was that the CK722 is very noisy compared to the high quality GE units I used previously and the gain was very poor for the earliest black CK722. The newest 1960 silver CK722 was the noisiest one but had the highest gain and so it worked best as the first transistor. The blue 1956 CK722 was middle of the road on gain and so it became the middle transistor and the 1955 black CK722 became the last transistor and was the one to drive the headphones. After switching around the transistors getting the radio to work the best as possible, it still wasn't comparable to the GE transistors, so I did some engineering. I changed the biasing and load resistors and worked on it one stage at a time. Increasing the 220K bias resistor for the noisy silver CK722 to 2.2 Meg and increasing the load resistor to 10 K quieted the transistor down quite a bit. Decreasing the bias resistor on the older blue and black CK722's to 100K increased the gain tremendously and the 2.2K load resistor gave the blue CK722 a clear sound. It now plays as well as the high quality GE transistors and is still noisy compared to the GE transistors, but is now acceptable. I initially used a 100K volume control, which worked nicely, but a 5K to 500K will work as well. I used a 500K control because it had an on/of switch on it, but the control doesn't have a nice even feel when adjusting the volume. There is a lot of control at the bottom and the top ends of the control, so a lower value would be better, but I didn't have a lower value with a switch in a vintage style. I stayed with 1½ volts so as not to put any undue stress on the old transistors, especially the 1955 black CK722. Even with only 1½ volts and only drawing 3mA it has amazing volume.

At this point the radio has been breadboarded so it is now time to construct a cabinet and mount the parts on some kind of chassis. My brother in Texas gave me some Chinaberry wood that he has been using to make rocking chairs and other furniture pieces and it has an awesome grain and color to it, so I decided to make a simple cabinet from the Chinaberry wood. Out came the table saw, router and the drill press. The Chinaberry is a unique wood to work with, easy to drill and also easy to chip on the corners when hand sanding, but it cuts easy with little burring/chipping with the table saw. The grain is very open and difficult to sand really smooth, so finishing it requires a wood filler or lots of coats of what ever one uses and in my case it was lacquer. My brother uses thick polyurethane as a filler and saves

Chinaberry sawdust that he mixes with wood glue and uses that as a wood filler. After a couple of hours I had the cabinet cut out and I used brass screws that were recessed to hold it together.

I took the front panel back in the radio shop and now to plan out where the variable capacitor, volume control and the circuit board will all go. I used the Hobby Lobby 1/8 " basswood for the circuit board and I painted it white after I sanded it. On a piece of paper I laid out where all the parts will go in pencil and I taped it to the circuit board and then I used a drill press to drill all the holes. The paper was removed and I inserted all the parts and soldered it. I mounted the board to the bottom of the variable capacitor and the variable was mounted to the front panel with screws attached to the front of the variable capacitor. I recessed all the mounting holes for the variable capacitor so the screws wouldn't interfere with the knobs. I put 4 binding posts on the left side of the cabinet for the ground and the three antenna connections and two binding posts were put on the right side of the cabinet for the headphones. This gave the radio an older appearance and the two antique knobs I used enhanced that older appearance. All the parts I used were vintage parts and so the circuit board definitely has that 1950's to early 1960's look.

Not much was said about the Chinaberry wood, but it is tree that was introduced into the US around 1830 from the Himalayas and was an ornamental tree. The tree is now considered a junk tree in Texas because its fruit is poisonous and its leaves give off a musky smell, but the wood is gorgeous and they do make pesticides from it.

Now a little bit about the front-end circuitry of this radio. I didn't have a single gang 365- pf capacitor, but I did have a dual 365-pf capacitor and that's what I used. So now I added a second coil and created a bandpass tuner, which greatly increases the selectivity, but also decreases the sensitivity. If this radio were to be used in a big city with lots of close by stations this would be the antenna connection to use because it would separate the stations better, so this would be a long antenna connection. I added 10 turns of #22 wire on the ferrite loopstick antenna to make another possible antenna connection, what I call a medium length antenna. There is a direct connection to the junction of the diode and variable capacitor for a short antenna. Attaching a ground to this radio also helps in its reception.

Should someone want to build this radio, you will find the audio coupling capacitors are not critical. The .01mfd capacitor between the diode and the first transistor can vary from a .01mfd to a 10mfd capacitor. The 2mfd electrolytics can vary from 1 to 10mfd. The larger values will give better bass response, but is barely noticeable especially with a small speaker. I used the 2mfd capacitors because I have several of them, they are vintage and in a pretty blue package. The base bias resistors are typically around 220K and it is a good starting point if one is experimenting with biasing. A word of caution here; If the base bias resistor is too low in value it can cause too much collector current to flow and can burn up your transistor. Using a current meter would be helpful. Notice that I didn't go any lower than 100K. The bias circuit used in this radio is called "Simple base bias" and is prone to thermal runaway, but is a high gain circuit that uses a minimum of parts. At 1½ volts thermal runaway is not a problem and so it is widely seen in circuits with a low voltage.

What started out as a simple one transistor radio wound up being a bit more complicated, but also performs a whole lot better. The Chinaberry cabinet makes it a showpiece.

NBC's First Broadcast

By Brain Rogers

In November, besides eating turkey, we'll mark the 90th anniversary of the first radio program broadcast by the then brand new National Broadcasting Company (NBC).

Will Rogers

On Monday, November 15, 1926, from the stage of the Grand Ballroom of the Waldorf Astoria Hotel in New York, the network sent what it called its "inaugural ball," to 25 stations in the East and Midwest. The stations were linked with New York by 3,600 miles of telephone cable.

The idea of listeners in several cities listening to the same program at the same time was heady stuff in 1926.

One of the inaugurating stations was WWJ in Detroit, now a CBS radio affiliate, on the air with an all-news format on 950 kHz. Others, according to *American Radio Networks, a History*, by Jim Cox, were KYW in Chicago, later Philadelphia; WTAM in Cleveland; WBZA in Boston; and WDAF in Kansas City.

The program lasted more than four hours and cost NBC upwards of $50,000, a huge amount then. (Not too shabby a sum now, either). Performing live were a symphony orchestra, a concert pianist, an oratorio society, and a comedy team. Remote pickups included a monologue by comedian Will Rogers from a theater dressing room in Kansas City and selections by operatic diva Mary Garden from Chicago.

One of the early proponents of network or "chain" broadcasting was a young Russian immigrant named David Sarnoff (1891-1971). Fascinated by the Morse code used to send messages,

Mary Garden

Announcing the

National Broadcasting Company, Inc.

National radio broadcasting with better programs permanently assured by this important action of the *Radio Corporation of America* in the interest of the listening public

The Radio Corporation of America is the largest distributor of radio receiving sets in the world. It handles the entire output in this field of the Westinghouse and General Electric factories.

It does not say this boastfully. It does not say it with apology. It says it for the purpose of making clear the fact that it is more largely interested, more selfishly interested, if you please, in the best possible broadcasting in the United States than anyone else.

Radio for 26,000,000 Homes

The market for receiving sets in the future will be determined largely by the quantity and quality of the programs broadcast.

We say quantity because they must be diversified enough so that some of them will appeal to all possible listeners.

We say quality because each program must be the best of its kind. If that ideal were to be reached, no home in the United States could afford to be without a radio receiving set.

Today the best available statistics indicate that 5,000,000 homes are equipped, and 21,000,000 homes remain to be supplied.

Radio receiving sets of the best reproductive quality should be made available for all, and we hope to make them cheap enough so that all may buy.

The day has gone by when the radio receiving set is a plaything. It must now be an instrument of service.

WEAF Purchased for $1,000,000

The Radio Corporation of America, therefore, is interested, just as the public is, in having the most adequate programs broadcast. It is interested, as the public is, in having them comprehensive and free from discrimination.

Any use of radio transmission which causes the public to feel that the quality of the programs is not the highest, that the use of radio is not the broadest and best use in the public interest, that it is used for political advantage or selfish power, will be detrimental to the public interest in radio, and therefore to the Radio Corporation of America.

To insure, therefore, the development of this great service, the Radio Corporation of America has purchased for one million dollars station WEAF from the American Telephone and Telegraph Company, that company having decided to retire from the broadcasting business.

The Radio Corporation of America will assume active control of that station on November 15.

National Broadcasting Company Organized

The Radio Corporation of America has decided to incorporate that station, which has achieved such a deservedly high reputation for the quality and character of its programs, under the name of the National Broadcasting Company, Inc.

The Purpose of the New Company

The purpose of that company will be to provide the best program available for broadcasting in the United States.

The National Broadcasting Company will not only broadcast these programs through station WEAF, but it will make them available to other broadcasting stations throughout the country so far as it may be practicable to do so, and they may desire to take them.

It is hoped that arrangements may be made so that every event of national importance may be broadcast widely throughout the United States.

No Monopoly of the Air

The Radio Corporation of America is not in any sense seeking a monopoly of the air. That would be a liability rather than an asset. It is seeking, however, to provide machinery which will insure a national distribution of national programs, and a wider distribution of programs of the highest quality.

If others will engage in this business the Radio Corporation of America will welcome their action, whether it be cooperative or competitive.

If other radio manufacturing companies, competitors of the Radio Corporation of America, wish to use the facilities of the National Broadcasting Company for the purpose of making known to the public their receiving sets, they may do so on the same terms as accorded to other clients.

The necessity of providing adequate broadcasting is apparent. The problem of finding the best means of doing it is yet experimental. The Radio Corporation of America is making this experiment in the interest of the art and the furtherance of the industry.

A Public Advisory Council

In order that the National Broadcasting Company may be advised as to the best type of program, that discrimination may be avoided, that the public may be assured that the broadcasting is being done in the fairest and best way, always allowing for human frailties and human performance, it has created an Advisory Council, composed of twelve members, to be chosen as representative of various shades of public opinion, which will from time to time give it the benefit of their judgment and suggestion. The members of this Council will be announced as soon as their acceptance shall have been obtained.

M. H. Aylesworth to be President

The President of the new National Broadcasting Company will be M. H. Aylesworth, for many years Managing Director of the National Electric Light Association. He will perform the executive and administrative duties of the corporation.

Mr. Aylesworth, while not hitherto identified with the radio industry or broadcasting, has had public experience as Chairman of the Colorado Public Utilities Commission, and, through his work with the association which represents the electrical industry, has a broad understanding of the technical problems which measure the pace of broadcasting.

One of his major responsibilities will be to see that the operations of the National Broadcasting Company reflect enlightened public opinion, which expresses itself so promptly the morning after any error of taste or judgment or departure from fair play.

We have no hesitation in recommending the National Broadcasting Company to the people of the United States.

It will need the help of all listeners. It will make mistakes. If the public will make known its views to the officials of the company from time to time, we are confident that the new broadcasting company will be an instrument of great public service.

RADIO CORPORATION OF AMERICA

OWEN D. YOUNG, *Chairman of the Board* — JAMES G. HARBORD, *President*

This ad appeared in November 1926 to announce the formation of NBC

In every sense of the word

NBC *is*

"Broadcasting Headquarters"

Take PROGRAMS . . . NBC's Red and Blue Networks sent out over 54,000 programs during 1937. 35 hours a day of the world's most popular programs, available to 24,500,000 radio families.

Take STATIONS . . . Completing its eleventh year, there are 142 affiliated stations broadcasting Blue and Red Network programs. Ten NBC associated short-wave stations make NBC the leader in international broadcasts.

Take PROGRAM BUILDING . . . For every one of these eleven years, NBC has set the style in programs. These styles, numbering many "Famous Firsts" in radio, have since become radio patterns.

Take TRANSCRIPTIONS . . . The NBC Recorded Program Service offers complete facilities for the creation, casting, production and recording of programs for National Spot and Local Advertising. NBC Thesaurus is used by no less than *220 station subscribers!*

Whether you Write it . . . Wire it . . . Phone it . . . Cable or Radio it

"RADIO CITY NEW YORK" is the World's best known Radio Address

Take SPOT and LOCAL ADVERTISING . . . NBC's Managed Stations are, everywhere, "Tops in Spot!" Super-power transmitters on clear channels cover major markets, making an economical lineup for spot advertisers who want to cover broad territories with a few stations. *Fifteen fine stations in ten key markets.*

Take ARTISTS SERVICE . . . NBC Artists Service is the largest talent sales organization in the world. It offers both personal management and valuable guidance to artists. To radio advertisers and their agencies, it offers not only specific talent to answer advertisers' sales problems, but sound program ideas as well, and complete casts.

. . . *These advantages, plus NBC's known primary concern that "the listener be served", first, have caused NBC to be known, wherever radio is mentioned, as* "BROADCASTING HEADQUARTERS"

NATIONAL BROADCASTING COMPANY

A RADIO CORPORATION OF AMERICA SERVICE

NBC magazine ad from 1938

Sarnoff, at age 15, got a job with the Marconi Wireless Company of America.

The story is told that, in April 1912, operating a wireless set for the Marconi Company at Nantucket Island, Massachusetts, the young radio man stayed at his code key for more than 72 hours relaying names of survivors of the sinking of the Titanic following the ship's collision with an iceberg.

Four years later, when working for Marconi in New York, Sarnoff, in a memo sent to his superiors, said, in part: "I have in mind a plan of development which would make radio a household utility. The idea is to bring music into the home by wireless. ... The same principle can be extended to numerous other fields, as for example receiving lectures at home ... Also, events of national importance can be simultaneously announced and received."

Later, the Radio Corporation of America (RCA), which had been founded in 1919, acquired the assets of the Marconi Company. NBC was formed by RCA to provide desirable programming to enhance interest in the purchase of the radio receivers it manufactured.

The idea must have worked, or at least it did on the evening of November 15, 1926. A woman, upon leaving the inaugural ball, turned to her husband and is quoted as saying, "My dear, I had no idea. We simply must get one of those radios first thing tomorrow."

By 1930, Sarnoff was president of NBC and, between 1947 and 1970, was chairman of the board of the Radio Corporation of America and its NBC offspring.

Only a few weeks following the inaugural broadcast, on New Year's Day 1927, a second group of NBC stations carried play-by-play coverage of the Rose Bowl football game, in which Alabama and Stanford grappled to a 7-7- tie. The announcer was Graham McNamee who was posthumously elected into the Radio Hall of Fame. Originally hoping to be an opera singer, McNamee began his career by joining the staff of WEAF, New York, in 1923.

In his book, Cox states that the 1927 Rose Bowl broadcast " ... was the start of a broadcasting (and sportscasting) heritage that continues on both radio and television in the modern age."

It started 90 years ago November 15.

(The Shop, continued from page 17)

"Anyway, I checked the 39 Ohm resistors and noted that they showed signs of distress – they were a darker brown and the color bands were discolored. The single one was up around 100 Ohms and the one with the 'piggy back' resistor was up around 75 Ohms, even with the paralleled resistor. The Marantz engineer was not the first to push the rule that carbon composition resistors should never be used where the continuous load is over 50% of power rating. Push the rule a little, and the resistors will discolor and shift up in resistance as the carbon inside literally burns off. Push the rule too much and they will actually shift down in resistance as the phenolic housing turns to pure carbon with the heat. In this case, they shifted upwards. I suspect the previous mechanic had noted the shift and decided to tack on the extra resistor to get the load back to 39 Ohms – not a good repair. I must say, it was a bit of a nuisance to get to the solder side of the board, but that is no excuse for lazy work. I replaced them with 3-Watt metal film resistors. Metal film

(Continued on page 24)

(The Shop, continued from page 23)

resistors do not exhibit that resistance shift. I also checked the other channel and found those resistors had shifted upward as well. Needless to say, I replaced those as well.

"The Marantz engineer also used carbon comp resistors as bleeder resistors in the power supply and those two 2.2K resistors had burned completely open. Those do not effect operation, but they are there for safety so I replaced them with 5-Watt wire wound resistors.

"You need to be very careful when you adjust R526 which sets the bias for the output transistors. The procedure in the manual calls for monitoring an AC power meter on the power cord of the amplifier, which I considered an odd adjustment. I think, in the future, I would be wise to leave this one alone unless the distortion check shows distortion at the one-Watt level. I should also mention, that when you do the full power tests, the heat sinks must be in the mounted position and have at least a couple of screws holding them in place. This is necessary to properly ground the heat sink. Without this, there will be instability when testing at higher frequencies – also putting output transistors in peril.

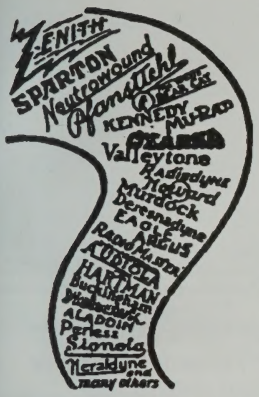
"Anyway, at this point I figured I was done with the major work and decided to replace the lamps on the meters. I noted that the called for 250 mA lamps were burned out, but before they had, they had caused the plastic on the back of the meters to soften and bulge a bit. I decided it would be better to use 150 mA, number 47 lamps to reduce the heat in the meter. It does make the display a bit dim but I figured that would be better than melting the plastic. When I went to adjust the meters so they would display accurately I noticed the right meter would not move more than about 20% up scale. This meter is quite close to the power transformer and the antics I had to use to extract it from the front panel did have me muttering a couple of nasty words.

"When I got the meter off the front panel, I opened it up and found that, at sometime in the past, something must have struck the front of the meter and one of the clips that holds the front clear plastic had broken off. The magnet on the meter had captured the clip and it wound up where it would block the meter movement. This was an easy fix. A couple of small dabs of glue served to hold the front plastic and the clip was removed. While I was at it, I cleaned the meter. Putting the meter back also caused a couple of nasty words and I decided to clean the left meter as well. Fortunately, the left meter is MUCH easier to remove and replace."

Art pointed to the amplifier. "And there it is. I think it is a handsome item and would look good where it can seen. Oh yea, one more thing. I think it interesting that the amplifier does not have a power switch. I guess they figured you would always plug it into the preamp."

I bent over the amplifier and noted that, indeed, the right meter would be a bear to extract. "Wow, that really is something," is about all I could add.

Art walked over to the bench. "Well, the testing is complete so let's do the listening test." It only took a few minutes for us to hook up speakers, a preamp, and a turntable. I must say, the listening test proved that it did, indeed, sound good! In fact, we were enjoying the music so much, we almost missed a customer at the door of the shop. Art turned down the music and went over to open the door and I leaned back to continue to enjoy the music.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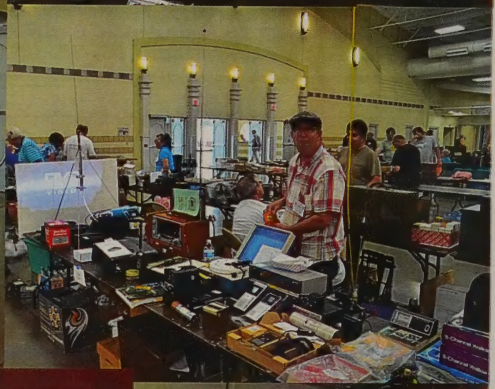

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